Q1) Units of time "t" is measured in hours.
Beginning amount: P at $t=0$; $P=100$ at $t=0$.
Ending amount is $A=450$ at $t=6$.

$A = Pe^{kt}$ $450 = 100e^{6k}$

$4.5 = e^{6k} \rightarrow \ln 4.5 = \ln e^{6k} = 6k \rightarrow k = \ln 4.5/6$

$\therefore k = 0.2507$

Q2) Find the decay rate The half-life is 5730 years

$0.5 = e^{5730k} \rightarrow \ln(0.5) = 5730k \rightarrow \frac{\ln(0.5)}{5730} = k$

We have the beginning amount of C-14 and ending amount. From this, get the age of the parchment.

$1 \cdot 10^{-12} = (1.3 \cdot 10^{-12})e^{[\ln(0.5)/5730]t}$

$1/1.3 = e^{[\ln(0.5)/5730]t} \rightarrow 5730 \ln(1/1.3)/\ln(0.5) = t$

$t = 2168.87$, The parchment is about 2170 years old, less than necessary 3250 years ago that the Trojan war took place.

Q3) In this problem we know that time "t" will be in hours, because growth given in terms of hours. Convert a day-and-a-half to 36 hours. $P=100$, find A at $t=36$
Use doubling time to find growth constant k.

$A = Pe^{kt}$

$200 = 100e^{6.5k} \rightarrow 2 = e^{6.5k} \rightarrow \ln(2)/6.5 = k$

$A = 100e^{36[\ln(2)/6.5]} \doteq 4648$ bacteria

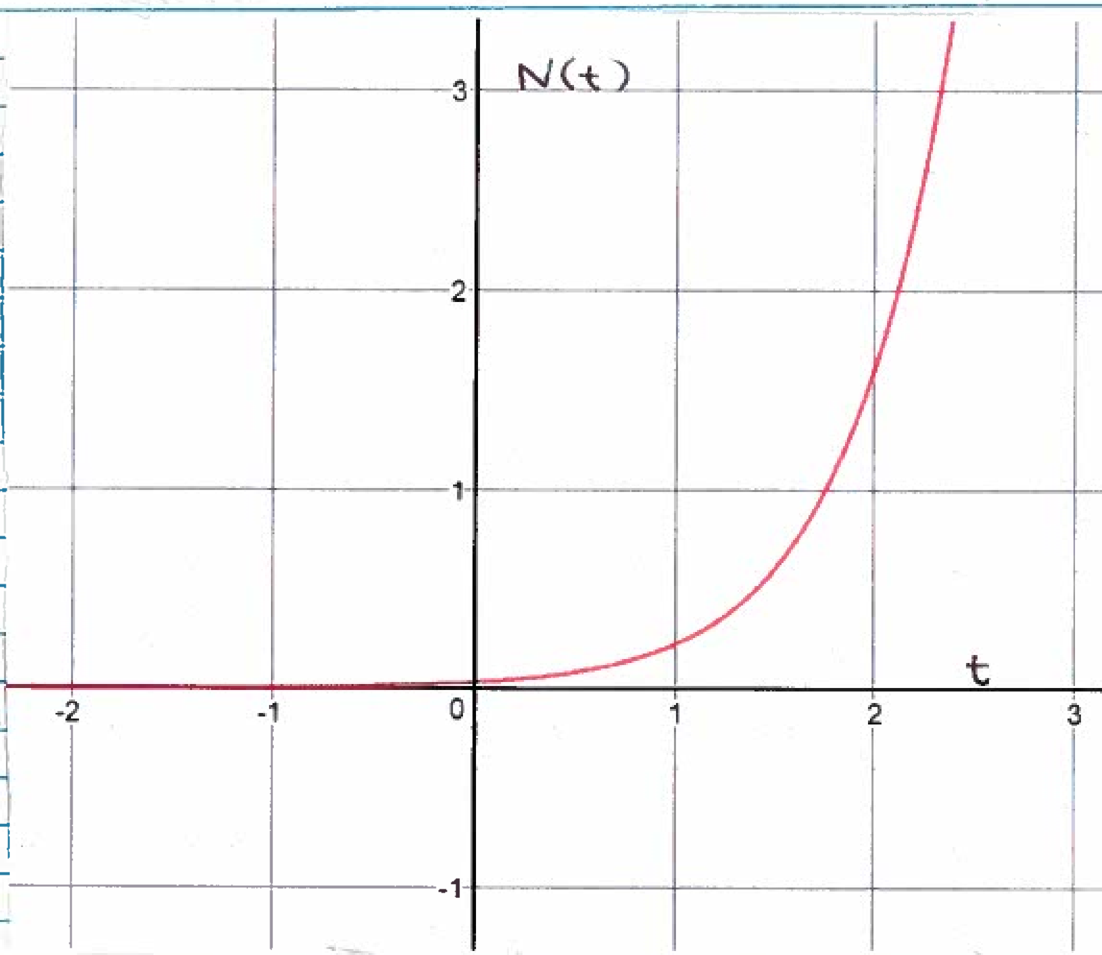
Q4) Since the decay rate is given in terms of minutes, then time "t" will be in minutes. There are no beginning and ending amounts given. From t=0 to t=9.45, half of the material is gone.

$0.5 = e^{9.45k} \rightarrow \ln(0.5) = 9.45k \rightarrow k = -0.07335$

∴ Decay constant for Mg = -0.07335/min

Q5) $N(t) = \dfrac{84}{1 + 2799e^{-2t}}$

$N(0) = \dfrac{84}{2800}$



$\lim_{t \to \infty} N(t) = 84$; $3.14159(1 + 2799e^{-2t}) = 84$

no solution!

Q6) Oil heated to 60°C.

Cools to 50°C after 6 minutes

Surrounding temp = 25°C

Time taken to cool from 50°C to 40°C.

$$T(t) = T_a + (T_o - T_a)e^{kt}$$

$$50 = 25 + (60 - 25)e^{6k} \rightarrow k = -0.0561$$

$$40 = 25 + (50 - 25)\exp[-0.0561t] \rightarrow t = 9.11 \text{ minutes}$$

Q7)

$$T(t) = T_s + (T_o - T_s)e^{-kt}$$

$$= 27 + (70 - 27)e^{-0.56}$$

$$= 27 + 43 \cdot 0.57$$

$$= 51.56^\circ C$$